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From: Jim Ray (USNO 202-762-1444)
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Subject: use of predicted GPS orbits
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The following paper is brought to your attention concerning the use of predicted GPS orbits. Even though the authors' focus is determination of precipitable water vapor (1 mm PWV = 6 mm zenith wet troposphere delay), which is the most demanding application of real-time GPS orbits, their conclusions regarding the use of orbit predictions are valid for other applications, such as time transfer. In particular, care must be taken to heed the IGS orbit accuracy codes or to otherwise account for the few "bad" satellites that frequently occur. Neglecting to do so can produce invalid results. --Jim

L.P. Kruse, B. Sierk, T. Springer, and M. Cocard, GPS-meteorology:
Impact of predicted orbits on precipitable water estimates,
Geophys. Res. Lett., 26(14), 2045-2048, 15 July 1999.

Abstract. Studies of atmospheric effects on Global Positioning System (GPS) signals have proven the possibility of deriving the total water vapor content from estimates of tropospheric path delays. The acuracy of GPS derived Precipitable Water (PW) depends (besides other parameters) on the quality of satellite orbits used in the analysis. High precision orbits provided by the International GPS Service (IGS) yield PW estimates with an accuracy of about 1 mm. While these orbits are provided with a delay of several days, weather forecasting requires near real-time determination of PW. Therefore operational meteorolgical GPS analysis would have to rely on orbit predictions. We investigate the impact of introducing predicted orbit information on the accuracy of GPS water vapor retrievals. The presented data were acquired during a 14-day field experiment carried out in the north-west region of Madrid, Spain using GPS and a Water Vapor Radiometer (WVR). The comparison of WVR measurements with estimated time series of PW using both 24 and 48 hour predicted orbits and final precise IGS orbits shows that the accuracy of PW decreases by a factor of about 2 from precise to predicted orbit data.